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Case Report

Stent migration after carotid artery stenting in long-term period: A rare complication

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Abstract
Stent migration is a rare complication of carotid artery stenting (CAS) and maypresent with ischemic stroke. A 71-year-old male patient with symptomatic left carotid stenosis was treated with CAS. The patient had a transient ischemic attack with mild weakness in the right upper extremity eight months later. Computed tomography angiography showed severe stenosis in the cervical ICA next to the stent. Downward migration of the stent on left ICA with about 50% stenosis next to the stent was seen in DSA. Another stent was placed from the cervical segment of ICA to CCA, covering the stenotic lesion.

Keywords
Stent Migration, Stenting, Long-term, Carotid Artery

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Introduction

Carotid artery stenting (CAS) is a treatment option in patients with symptomatic extracranial carotid stenosis [1]. Stroke, myocardial infarction, and death are well-known complications of CAS [2]. Stent restenosis or stent occlusion may occur over the long-term period. Stent migration is a rare complication of CAS.

Stent migration is the movement of the stent upwards or downwards from where it was first placed. There are only three patients with stent migration after CAS in the literature. The cause of stent migration is not known. Badruddin et al. reported that the watermelon-seeding effect might be the cause of stent migration [3]. In this publication, a patient with stent migration after CAS was reported.

Case Report

A 71-year-old male patient with hypertension, diabetes mellitus, coronary artery disease, and smoking had a dysarthria recovered within one hour. There were two lacunary infarctions in the left frontal lobe on diffusion-weighted magnetic resonance imaging. Computed tomography angiography (CTA) showed 80% stenosis in the origin of the left internal carotid artery (ICA). The patient was treated with acetylsalicylic acid (ASA) 100 mg/day and clopidogrel 75 mg/day for two weeks before CAS. Digital subtraction angiography (DSA) showed 65% stenosis in the origin of the left ICA (Figure 1). The diameters of the common carotid artery (CCA) and ICA were respectively 5.7 mm and 3.6mm. A Spider FX 5 mm (Medtronic, Minneapolis, USA) distal protection device was deployed to distal cervical ICA. Predilataion was applied to stenosis using a 3.5x15mm balloon inflated with 6 atm pressure. Then a Protege 8-6x30mm stent (Medtronic, Minneapolis, USA) was placed from ICA to CCA, covering the stenotic lesion (Figure 1). The patient was discharged with ASA 100mg/day, clopidogrel 75mg/day, and atorvastatin 10 mg/day on the following day.

Eights months later, the patient had a transient ischemic attack with mild weakness in the right upper extremity. Doppler ultrasonography (USG) showed a 70-99% restenosis in the distal segment of the stent on the left ICA. There was severe stenosis in the cervical ICA next to the stent on CTA. DSA showed downward migration of the stent on the left ICA, with about 50% stenosis next to the stent (Figure 2). A Spider FX 6 mm (Medtronic, Minneapolis, USA) distal protection device was deployed to distal cervical ICA. Mer 8-6x40 mm stent (Balton, Poland) was placed from the cervical segment of ICA to CCA, covering the stenotic lesion (Figure 3). Then balloon angioplasty (post-dilatation) was applied with a 4.5x20 mm balloon catheter at 8 atm pressure. The patient was discharged home the following day with ASA 100mg/day, clopidogrel 75mg/day, and atorvastatin 10 mg/day treatments.

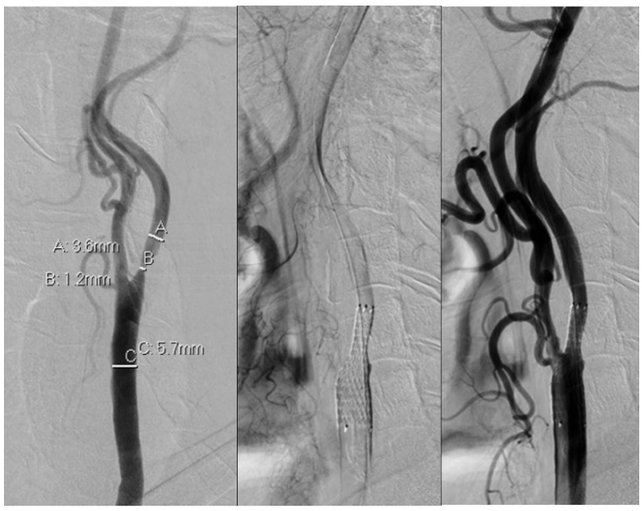

Figure 1. A 71-year-old male patient with symptomatic 65% left ICA stenosis. A Protege 8-6x30 mm stent was placed from the left ICA to CCA.

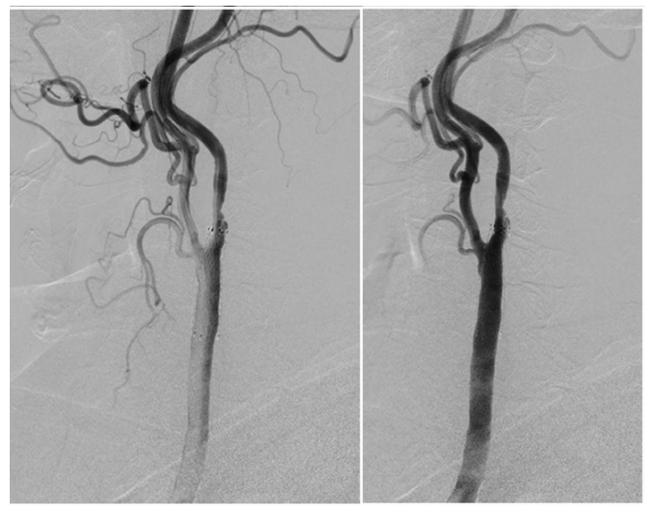

Figure 2. Second DSA image after 8 months. Downward migration of the stent and 50% stenosis on the left ICA.

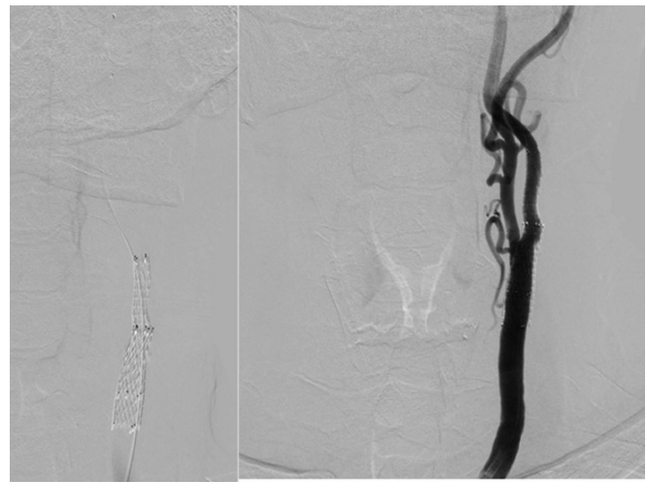

Figure 3. Mer 8-6x40 mm stent was placed from the left ICA to CCA covering the stenotic segment.

Discussion

Stent migration is a rare complication of CAS. This complication usually occurs after the placement of flow-diverter stents in the treatment of cerebral artery aneurysms. There are only three case reports about stent migration after CAS. Stent migration was detected immediately in the first patient, at the 15th month in the second patient, and at the eighth month in the third patient, similar to our patient [3-5]. The causes of stent migration are not well-known. The most popular hypothesis

is the watermelon-seeding effect, reported by Badruddin et al [3]. The watermelon seeding effect is the instability of the balloon across the stenosis and slipping out of the stenotic segment to a less constrained segment [3]. A significant difference between the diameters of inflow and outflow vessels may cause a watermelon-seeding effect [6]. However, the watermelon-seeding effect does not occur in carotid stents usually. Undersized stents may be another possible risk factor for stent migration [3]. However, the diameter of the stent was not smaller than CCA. The CCA and ICA diameters were 5.7mm and 3.6mm (Figure 1), and an undersized stent was not placed in the first process (Protege 8-6x30mm). Additionally, an increased stent/vessel diameter ratio in the distal segment may migrate the stent to the proximal by causing more radial force [3]. This patient had an increased stent/vessel diameter ratio in the distal segment (1.66 vs. 1.4). However, there are no actual data about this in the literature. There is no definite information about the association between stent migration and stent cell type. Badruddin et al. reported that closed-cell stents with a greater metal surface might provide more contact between endothelium and metal, which may cause more anchoring and prevent the risk of stent migration [3]. Swarnkar et al. reported that open-cell design stents might reduce migration risk by expanding in varying forms across the vessel surface [4]. However, stent migration was reported in both stent types. Stent migration occurred with an open-cell stent in this case.

Another possible cause of stent migration is the expansion of vessels after revascularization [3]. The diameter of the vessel may reduce due to low flow, and the length of the stent may be seen long when it was placed first. However, the vessel may reexpand after establishing the blood flow, rendering the diameter of the stent small for the newly expanded vessel and shortening the stent with the accordion effect [7]. Insufficient neo-endothelialization is another possible cause of stent migration [7]. Neo-endothelialization of the stent begins a few weeks after CAS. Smoking and uncontrolled HT are factors that can affect neo-endothelialization [8]. Thus, patients should give up smoking, and HT should be controlled well after CAS. HT was under control in this patient. However, he continued smoking after the first CAS.

Doppler USG is the Standard technique used to follow patients treated with CAS. Doppler USG should be performed within three months after CAS, every six months for two years, and then annually [8]. This patient did not come to doppler USG control after the procedure. Doppler USG, performed after TIA, showed restenosis in the distal segment of the stent, and stent migration was observed in DSA. If the patient complied with his follow-up program, stent migration could be diagnosed early and treated before causing symptoms.

Conclusion

Stent migration is a rare complication of CAS. Stent migration may occur after six months of CAS, and it may cause acute ischemic stroke. Doppler USG should be performed in all patients within three months after the procedure, and the patients should follow their controls. HT and smoking should be controlled well after CAS. However, all causes of stent migration are not well-known. Further studies will give us more information about this complication.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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